University of New England - Maine
Access Provided by:
SILVERCHAIR

Chapter 24: Gastroesophageal Reflux Disease

INTRODUCTION

- *Gastroesophageal reflux disease* (GERD) is defined by the American College of Gastroenterology guideline as a condition in which refluxed gastric contents into the esophagus cause symptoms and/or complications.
- In some cases, reflux is associated with defective lower esophageal sphincter (LES) pressure or function. Some foods and medications decrease LES pressure (Table 24-1).
- Complications from long-term acid reflux include esophagitis, esophageal strictures, Barrett esophagus, and esophageal adenocarcinoma.

Downloaded 2026-3-8 5:48 PM Your IP is 176.123.19.29
Chapter 24: Gastroesophageal Reflux Disease,
©2026 McGraw Hill. All Rights Reserved. Terms of Use • Privacy Policy • Notice • Accessibility

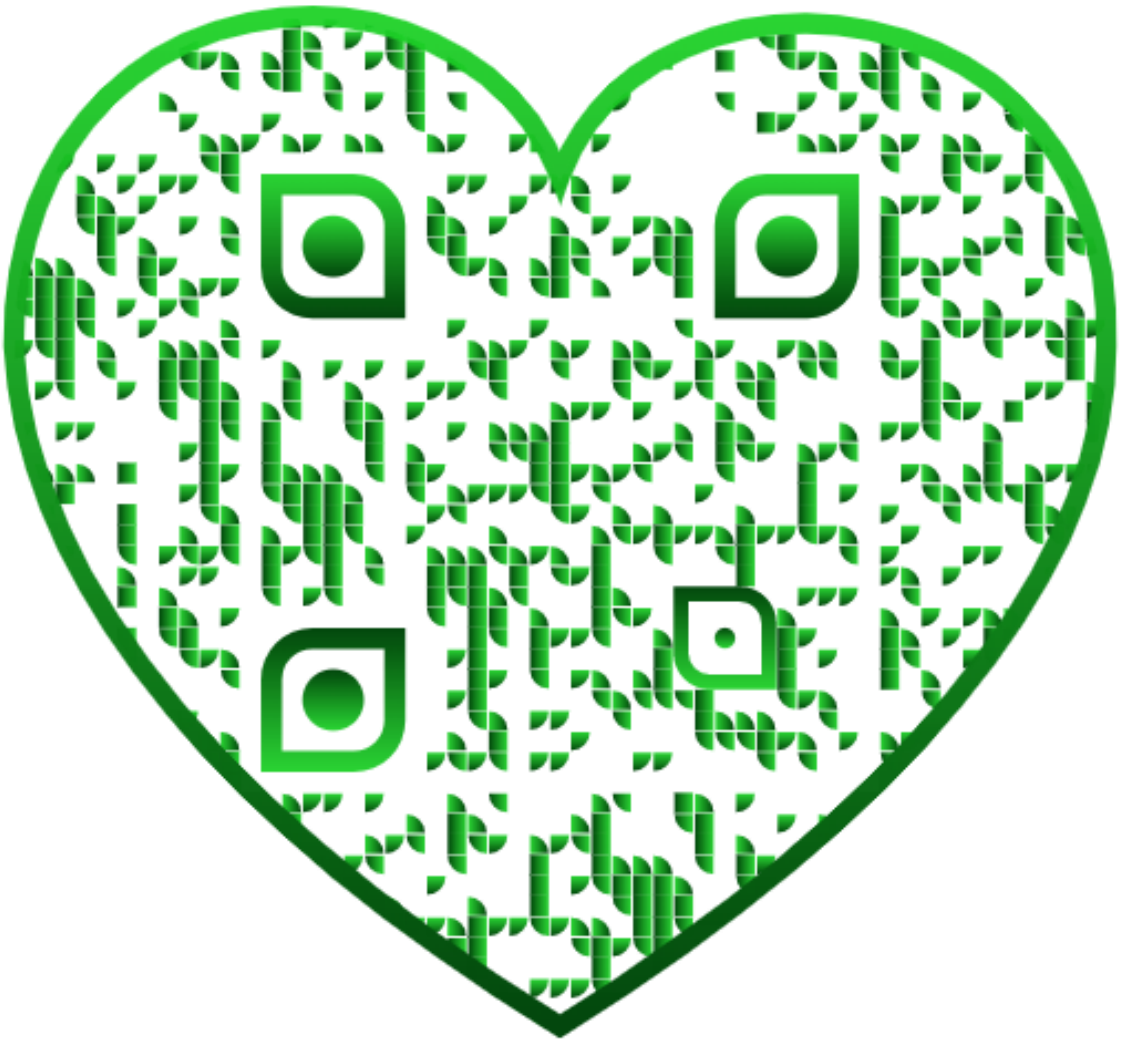

TABLE 24-1

Foods and Medications That May Worsen GERD Symptoms

Foods/Beverages	Medications
Decreased Lower Esophageal Sphincter Pressure	
Fatty meal	Anticholinergics
Carminatives (peppermint, spearmint)	Barbiturates
Chocolate	Caffeine
Coffee, cola, tea	Dihydropyridine calcium channel blockers
Garlic	Dopamine
Onions	Estrogen
Chili peppers	Nicotine
Alcohol	Nitrates Progesterone Tetracycline Theophylline
Direct Irritants to the Esophageal Mucosa	
Spicy foods	Aspirin
Orange juice	Bisphosphonates
Tomato juice	Nonsteroidal anti-inflammatory drugs (NSAIDs)
Coffee	Iron
Tobacco	Quinidine Potassium chloride

CLINICAL PRESENTATION

- *Symptom-based GERD* (with or without esophageal tissue injury) typically presents with heartburn—a substernal warmth or burning rising from the abdomen that may radiate to the neck. It may vary in intensity and worsen with reflux-promoting activities (eg, lying down, bending over, eating high-fat meals). Other symptoms are water brash (excess saliva), belching, and regurgitation. Alarm symptoms suggesting complications include dysphagia, odynophagia, bleeding, and weight loss. When no tissue injury or erosions are seen, it's called nonerosive reflux disease (NERD).

- *Tissue injury–based GERD* (with or without esophageal symptoms) may present with esophagitis, esophageal strictures, Barrett esophagus, or esophageal carcinoma. Alarm symptoms may also occur.

Downloaded 2026-3-8 5:48 PM Your IP is 176.123.19.29
Chapter 24: Gastroesophageal Reflux Disease,
©2026 McGraw Hill. All Rights Reserved. Terms of Use • Privacy Policy • Notice • Accessibility

- Extraesophageal symptoms can include chronic cough, laryngitis, wheezing, and asthma.

DIAGNOSIS

- Diagnosis is based on symptoms, endoscopy, reflux monitoring, and response to proton-pump inhibitors (PPIs).
- Patients with typical symptoms but unconfirmed GERD don't need initial invasive esophageal evaluation before an empiric 8-week PPI trial. Endoscopy helps assess mucosal damage and detect complications like Barrett esophagus, strictures, or adenocarcinoma.
- Ambulatory pH monitoring, combined impedance–pH monitoring, high-resolution esophageal pressure topography (HREPT), impedance manometry, and an empiric trial of a proton pump inhibitor (PPI) may be helpful in some cases.

TREATMENT

- Goals of Treatment: Reduce or eliminate symptoms, decrease frequency and duration of gastroesophageal reflux, promote healing of injured mucosa, prevent complications, and improve quality of life.

General Approach

- Therapy aims to reduce reflux acidity and gastric volume, improve gastric emptying, increase LES pressure, enhance esophageal acid clearance, and protect the esophageal lining.
- Treatment depends on severity and may include:

  ✓ Lifestyle changes and self-directed use of **antacids** or nonprescription acid suppressants (**histamine 2–receptor antagonists [H_2RAs]** and/or **PPIs**)

  ✓ Prescription-strength acid suppression therapy

  ✓ Antireflux surgery

  ✓ Endoscopic procedures

- Initial intervention depends on the patient's condition (symptom frequency, esophagitis severity, and complications). A step-down approach is usually preferred, starting with a PPI instead of an H_2RA, and then reducing to the lowest effective acid suppression dose (**Table 24-2**).
- Patient-directed therapy (self-treatment with nonprescription medication) is suitable for mild, occasional symptoms. Patients with continuous symptoms lasting over 2 weeks should seek medical care and are typically started on empiric acid-suppression therapy. Patients not responding or with alarm symptoms (eg, dysphagia) should undergo endoscopy.

TABLE 24-2

Therapeutic Approach to GERD in Adults

Recommended Treatment Regimen	Brand Name	Oral Dose	Comments
Intermittent, Mild Heartburn (individualized lifestyle modifications + patient-directed therapy with antacids and/or nonprescription H_2RAs or nonprescription PPI)			
Individualized lifestyle modifications			Lifestyle modifications should be tailored to each patient.

Downloaded 2026-3-8 5:48 PM Your IP is 176.123.19.29
Chapter 24: Gastroesophageal Reflux Disease,
©2026 McGraw Hill. All Rights Reserved. Terms of Use • Privacy Policy • Notice • Accessibility

Patient-Directed Therapy with Antacids (≥12 years old)			
Magnesium hydroxide/aluminum hydroxide with simethicone	Maalox	10–20 mL as needed or after meals and at bedtime	If symptoms persist after 2 weeks of lifestyle changes and nonprescription medications, seek medical attention. Do not exceed 16 teaspoonfuls per 24 hours.
Antacid/alginic acid	Gaviscon	2–4 tablets or 10–20 mL after meals and at bedtime	Alginic acid content varies by product; more is better (at least 500 mg).
Calcium carbonate	Tums	500 mg, 2–4 tablets as needed	
Patient-Directed Therapy with Nonprescription H_2RAs (up to twice daily) (≥12 years old)			
Cimetidine Famotidine Nizatidine	Tagamet HB Pepcid AC Axid AR	200 mg 10–20 mg 75 mg	If symptoms persist after 2 weeks of lifestyle changes and nonprescription medications, seek medical attention.
Patient-Directed Therapy (>18 years old) with Nonprescription PPIs (taken once daily)			
Esomeprazole Lansoprazole Omeprazole Omeprazole/sodium bicarbonate	Nexium 24HR Prevacid 24HR Prilosec OTC Zegerid OTC	20 mg 15 mg 20 mg 20 mg/1100 mg	If symptoms persist after 2 weeks of lifestyle changes and nonprescription medications, seek medical attention.
Symptomatic Relief of GERD (individualized lifestyle modifications + prescription-strength H_2RAs or prescription-strength PPIs)			
Individualized lifestyle modifications			Lifestyle modifications should be tailored to each patient.
Prescription-Strength H_2RAs (for 6–12 weeks)			
Cimetidine (off-label use) Famotidine Nizatidine	Tagamet Pepcid Axid	400 mg four times daily or 800 mg twice daily 20 mg twice daily 150 mg twice daily	For typical symptoms, start empiric treatment with prescription-strength acid suppression. If symptoms recur, consider maintenance therapy. Note: Most patients will require standard doses for maintenance therapy.
Prescription-Strength PPIs (for 4–8 weeks)			
Dexlansoprazole Esomeprazole Lansoprazole Omeprazole	Dexilant Nexium Prevacid Prilosec	30 mg once daily for 4 weeks 20–40 mg once daily 15 mg once daily	For typical symptoms, start empiric treatment with prescription-strength acid suppression therapy Patients with moderate-to-severe symptoms should begin with a PPI. If symptoms recur, consider maintenance therapy.

Downloaded 2026-3-8 5:48 PM Your IP is 176.123.19.29
Chapter 24: Gastroesophageal Reflux Disease,
©2026 McGraw Hill. All Rights Reserved. Terms of Use • Privacy Policy • Notice • Accessibility

Omeprazole/sodium bicarbonate Pantoprazole (off-label use) Rabeprazole	Zegerid Protonix Aciphex	20 mg once daily 20 mg once daily 40 mg once daily 20 mg once daily	
Potassium-Competitive Acid Blocker			
Vonoprazan	Voquezna	10 mg once daily	
Healing of Erosive Esophagitis or Treatment of Patients with Moderate-to-Severe Symptoms or Complications (individualized lifestyle modifications + high-dose H_2RAs *or* PPIs *or* antireflux surgery)			
Individualized lifestyle modifications			Lifestyle modifications should be tailored to each patient.
PPIs (up to twice daily for up to 8 weeks)			
Dexlansoprazole Esomeprazole Lansoprazole Omeprazole Pantoprazole Rabeprazole	Dexilant Nexium Prevacid Prilosec Protonix Aciphex	60 mg daily 20–40 mg daily 30 mg once or twice daily 20 mg once or twice daily 40 mg once or twice daily 20 mg once or twice daily	If symptoms improve, consider maintenance therapy. PPIs are most effective for patients with extraesophageal symptoms, complications, or erosive disease.
Potassium-Competitive Acid Blocker			
Vonoprazan	Voquezna	20 mg once daily	

H_2RA, histamine$_2$-receptor antagonist; PPI, proton pump inhibitor.

NONPHARMACOLOGIC THERAPY

- Potential lifestyle changes depending on the patient's situation:
  - ✓ Elevate head of the bed by placing 6- to 8-in blocks under the headposts. Sleep on a foam wedge.
  - ✓ Weight reduction for overweight or obese patients.
  - ✓ Avoid foods that decrease LES pressure (eg, fats, chocolate).
  - ✓ Include protein-rich meals to augment LES pressure.
  - ✓ Avoid foods with irritant effects on the esophageal mucosa (eg, citrus juices, coffee, pepper).
  - ✓ Eat small meals and avoid eating immediately prior to sleeping (within 3 hours if possible).
  - ✓ Stop smoking.

Downloaded 2026-3-8 5:48 PM Your IP is 176.123.19.29
Chapter 24: Gastroesophageal Reflux Disease,
©2026 McGraw Hill. All Rights Reserved. Terms of Use • Privacy Policy • Notice • Accessibility

✓ Avoid alcohol.

✓ Avoid tight-fitting clothes.

✓ For medications that irritate the esophageal mucosa, take in the upright position with plenty of liquid or food (if appropriate).

- Consider antireflux surgery (eg, laparoscopic Nissen fundoplication) when long-term medication is undesirable or complications arise. In obese patients (BMI >35 kg/m^2), laparoscopic Roux-en-Y gastric bypass is preferred if surgery is planned.
- Transoral incisionless fundoplication may be useful when regurgitation is the primary symptom in patients desiring to avoid long-term PPI therapy and who do not want to undergo surgery.
- Magnetic sphincter augmentation can improve lower esophageal resistance and reduce GERD symptoms.

PHARMACOLOGIC THERAPY

Antacids and Antacid-Alginic Acid Products

- Antacids should be used only for on-demand symptom relief of mild GERD symptoms and are often combined with acid suppression therapies. Patients requiring frequent use for chronic symptoms should receive prescription-strength acid suppression instead.
- Some antacids contain alginic acid, which doesn't neutralize acid or increase LES pressure but forms a viscous solution that floats on gastric contents. This serves as a barrier protecting the esophagus and reduces reflux episodes. Efficacy data indicating endoscopic healing are lacking.
- Antacids have a short duration, requiring frequent doses throughout the day for continuous relief. Taking them after meals can extend relief from 1 hour to 3 hours, but bedtime doses don't maintain overnight suppression. Depending on magnesium or aluminum content, they may cause diarrhea or constipation. Antacids also interact with tetracycline, ferrous sulfate, isoniazid, sulfonylureas, and fluoroquinolones.

Proton Pump Inhibitors

- **Dexlansoprazole, esomeprazole, lansoprazole, omeprazole, pantoprazole**, and **rabeprazole** inhibit hydrogen potassium adenosine triphosphatase in gastric parietal cells, reducing gastric acid secretion with strong, long-lasting antisecretory effects.
- PPIs relieve symptoms faster and heal more effectively than H_2RAs. Empirical treatment is recommended for patients with troublesome symptoms. Twice-daily dosing is used if once-daily therapy fails.
- Common side effects include headache, diarrhea, nausea, and abdominal pain. Community-acquired pneumonia may occur with short-term use. Long-term risks include enteric infections, vitamin B_{12} deficiency, hypomagnesemia, and bone fractures. PPIs reduce absorption of **ketoconazole** and **itraconazole,** which require an acidic environment for absorption. Omeprazole may inhibit CYP2C19, impairing clopidogrel activation and efficacy.
- Due to degradation in acid, PPIs come in delayed-release forms. Dexlansoprazole, esomeprazole, lansoprazole, and omeprazole have enteric-coated granules in capsules. These can be mixed in applesauce or orange juice if swallowing is difficult. For nasogastric tubes, mix with 8.4% sodium bicarbonate solution. Esomeprazole granules can be dispersed in water. Esomeprazole, omeprazole, and pantoprazole are also available in suspension powder packets, and lansoprazole is available as a delayed-release, orally disintegrating tablet. Delayed-release pantoprazole or rabeprazole tablets should not be split, crushed, or chewed. Dexlansoprazole is a dual delayed-release capsule, with the first release occurring 1–2 hours after the dose, and the second release occurring 4–5 hours after the dose.
- **Zegerid** combines omeprazole 20 or 40 mg with 1100 mg sodium bicarbonate in immediate-release oral capsules and powder for oral suspension. Take on an empty stomach at least 1 hour before a meal. Capsules must be swallowed whole; powder is an alternative for those using nasogastric tubes.
- **IV esomeprazole** and **pantoprazole** are available for patients unable to take oral medications, but they are not more effective than oral

Downloaded 2026-3-8 5:48 PM Your IP is 176.123.19.29
Chapter 24: Gastroesophageal Reflux Disease,
©2026 McGraw Hill. All Rights Reserved. Terms of Use • Privacy Policy • Notice • Accessibility

preparations and are significantly more expensive.

- Patients should take oral PPIs in the morning 30–60 minutes before breakfast or their largest meal of the day. Dexlansoprazole can be taken without regard to meals. When dosed twice daily, the second dose should be taken 10–12 hours after the morning dose and before a meal or snack.

Potassium-Competitive Acid Blockers (PCAB)

- **Vonoprazan** (Voquenza) is a PCAB indicated for the healing and maintenance of healing of erosive esophagitis, and for the relief of heartburn in adults with erosive GERD or NERD. It blocks potassium binding to hydrogen-potassium ATPase in parietal cells.
- Unlike PPIs, it does not require active proton pumps, has more rapid absorption, sustains an intragastric pH above 4 for 24 hours, has a longer half-life, and is more potent.
- For erosive esophagitis, use 20 mg once daily for 8 weeks, then 10 mg once daily for up to 6 months. For NERD-related heartburn, use 10 mg once daily for 4 weeks.
- Common side effects are diarrhea, nausea, hypertension, and urinary tract infections. Long-term risks include *C. difficile* infection, hypomagnesemia, and fractures.
- Reserve vonoprazan for PPI-intolerant or nonresponsive patients because long-term safety is not known.

Histamine 2–Receptor Antagonists

- **Cimetidine, ranitidine**, and **famotidine** in divided doses effectively treat mild-to-moderate GERD. Low-dose nonprescription H_2RAs or standard twice-daily doses may relieve mild symptoms. Patients unresponsive to standard doses may be acid hypersecreters and need higher doses (**Table 24-2**). However, if H_2RA doses don't provide relief, switching to a PPI is more cost-effective and clinically efficient. H_2RA efficacy varies and is often less than desired. Extended treatment is often necessary.
- Common side effects include headache, fatigue, dizziness, constipation, or diarrhea. Cimetidine may inhibit the metabolism of theophylline, warfarin, phenytoin, nifedipine, and propranolol, among other drugs.
- Because all H_2RAs are equally effective, selection of the specific agent should be based on differences in pharmacokinetics, safety profile, and cost.

Prokinetic Agents

- Prokinetic agents are less effective than acid-suppression therapy for managing GERD and have undesirable side effects. They may be helpful as adjuncts for patients with motility defects (eg, LES incompetence, decreased esophageal clearance, delayed gastric emptying).
- **Metoclopramide** should not be routinely recommended for GERD. As a dopamine antagonist, it increases LES pressure and accelerates gastric emptying but does not improve esophageal clearance. It may relieve symptoms in some patients, although evidence for endoscopic healing is lacking. Common side effects include somnolence, nervousness, fatigue, dizziness, weakness, depression, diarrhea, and rash. CNS effects such as extrapyramidal symptoms and tardive dyskinesia limit its usefulness.
- **Bethanechol** has limited value due to side effects (eg, urinary retention, abdominal discomfort, nausea, flushing) and is not routinely recommended for GERD.
- **Domperidone** (unavailable in the United States) blocks dopamine, increasing LES pressure and gastric motility. It has been studied in combination with PPI therapy for additional symptom relief when PPIs alone are insufficient. Improved symptom control and a better side effect profile may offer advantages over other prokinetic agents.

Mucosal Protectants

Downloaded 2026-3-8 5:48 PM Your IP is 176.123.19.29
Chapter 24: Gastroesophageal Reflux Disease,
©2026 McGraw Hill. All Rights Reserved. Terms of Use • Privacy Policy • Notice • Accessibility

- **Sucralfate** is a nonabsorbable aluminum salt of sucrose octasulfate. It has limited value in treating GERD but may be useful for managing radiation esophagitis and bile or nonacid reflux GERD.

Combination Therapy

- Combination therapy with an acid-suppressant and a promotility agent or mucosal protectant may seem logical, but supporting data are limited. This approach is not recommended unless the patient has GERD with motor dysfunction. Adding the omeprazole-sodium bicarbonate immediate-release product to once-daily PPI therapy is an alternative for nocturnal GERD symptoms.

Maintenance Therapy

- Many GERD patients relapse after stopping medication, so maintenance therapy is often needed. Long-term treatment helps prevent complications and worsening esophageal function in patients with recurring symptoms after stopping or reducing therapy.
- Most patients need standard doses to prevent relapse. PPIs are preferred for moderate-to-severe esophagitis or symptoms. Typical once-daily doses include omeprazole 20 mg, lansoprazole 30 mg, rabeprazole 20 mg, or esomeprazole 20 mg. Lower or alternate-day dosing may work for milder cases
- "On-demand" PPI therapy—used only when symptoms arise—can be effective for endoscopy-negative GERD.

EVALUATION OF THERAPEUTIC OUTCOMES

- Monitor GERD symptom frequency and severity and educate patients on signs of complications needing immediate care, such as dysphagia. Evaluate persistent symptoms for strictures or other issues.
- Watch for side effects and extraesophageal symptoms such as laryngitis, asthma, or chest pain, which may need evaluation.

See Chapter 53, Gastroesophageal Reflux Disease, authored by Dianne May, Devin L. Lavender, and Satish S.C. Rao, for a more detailed discussion of this topic.

Downloaded 2026-3-8 5:48 PM Your IP is 176.123.19.29
Chapter 24: Gastroesophageal Reflux Disease,
©2026 McGraw Hill. All Rights Reserved. Terms of Use • Privacy Policy • Notice • Accessibility